August 7, 1964

Professor Arne Tiselius
University of Uppsala
Uppsala, Sweden

Dear Dr. Tiselius:

Your warm and constructive letter was very much appreciated. In a way I feel sorry for having burdened you with questions to which there could be only the answers you stated so directly.

Your handwriting gave me no difficulty, less than I have in reading my own.

You alluded to some possibility of a more personal discussion, which would indeed please me very much. May I indulge in a guess - that since you were involved in the Athens meeting you were also participating in a conference the Greek government is calling concerning its plans for a new university. I will, however, be unable to attend; but I thought you might be interested in the suggestion attached.

I enjoyed your paper on harmony very much. Actually, I do not see such a serious problem (nor any possibility of constructive redirection) in programming basic research. Hopefully, there will always be a few adventurous pioneers who react against the local conformities, and no plan for basic research seems better than a misdirected one such as might too readily evolve. It is technological development that consumes much more of our resources and has the most potent impact on society, and hence calls for studied harmony.

So to your remarks on computers: I find most scientists still do not take them seriously enough as intellectual partners. As long as they are preoccupied with tedious arithmetic, as they have mainly been till now, they are just machines of one more kind. But I think it is already obvious that the mechanical abilities of present machines are already less of a limitation to their creative applications than our understanding of how to program them effectively. And, of course, the hardware is evolving very rapidly.

We have started a direct interest in this question, using mass spectrometry as a prototype problem; so far we have succeeded only in the tritest (though perhaps useful) results from the standpoints both of real-time computer

control of the instrumental system and (more challenging), the logical analysis of the data. Just recently we have some better insight into the most efficient ways of representing organic molecules as "tree structures" which we have badly needed for the feeblest possibility of transferring structural intuitions to the computer.

Computers are hardly used in biochemical laboratories today. Do your remarks about them reflect some developments along these lines in your own institute?

Sincerely yours,

Joshua Lederberg

JL:as

Encl.